



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/526,930	03/08/2005	Udo Rotermund	266139US0PCT	7506
22850	7590	01/21/2009		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
SMITH, JENNIFER A				
ART UNIT		PAPER NUMBER		
1793				
NOTIFICATION DATE		DELIVERY MODE		
01/21/2009		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com

oblonpat@oblon.com

jgardner@oblon.com

Office Action Summary

Application No.

10/526,930

Applicant(s)

ROTERMUND ET AL.

Examiner

JENNIFER A. SMITH

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 10/24/2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/ICE)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of Application

Claims 1, 9, 10, and 16 have been amended.

Claims 31-47 have been added.

Claims 1-47 are presented for examination.

Withdrawal of Claim Rejections - 35 USC § 112

The rejection of claims 9, 10, and 16 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, is withdrawn in view of Applicant's amendments to the claims. Applicant's amendments, with regard to these claims, necessitated the new grounds of rejection presented in this Office action.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 4-5, 13-15, 17, 18, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and further in view of Wallajapet et al. (US Patent No. 5,948,829).

In regard to claims 1, 4, and 13-15, Biesmans teaches synthesis of carbon aerogels (foam) by pyrolysis of (nitrogen containing) polyisocyanate based aerogels [See Section 2. Experimental Procedure]. The aerogels have a high porosity (shown in Figure 4) and open cell content (see Table 1). While the Biesman reference does not inherently disclose the values of porosity and open cell content, it would be obvious to one of ordinary skill that a carbon foam, prepared via the same process would have the same instantly claimed physical characteristics. The aerogels of the Biesmans reference are 100% by mass of the polyisocyanate polymer (which is inherently has a nitrogen content of more than 6% by mass). In regard to the weight of carbon, the Biesmans reference teaches a "carbon aerogel" and therefore inherently has a carbon content above 70% by weight.

Biesmans fails to teach the incorporation of an inorganic material into the structure.

Wilmsen teaches a process for producing foams. Calcium carbonate is a possible additive in solid or liquid form [See Claim 9].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize an inorganic oxide such as calcium carbonate as taught by Wilmsen in the foam preparation method taught by Biesmans because such an additive is used for modifying and improving the structural and physical properties of the foam [See Wilmsen, Column 3, lines 46-48].

In regard to the amended feature of claim 1, the Biesmans and Wilmsen references fail to explicitly teach further heat treatment in water vapor and/or carbon dioxide.

Wallajapet et al. teaches a foam and process for preparing a polymeric foam. If the recovered foam structure does not yet exhibit the desired physical properties, it may be necessary to treat the recovered polymeric foam structure with an additional process step. Suitable post treatment conditions include using heat treatment or steam or high humidity treatment [See Column 14, lines 48-62]. One of skill in the art would have

been motivated to include a further treatment step to the foam produced by the Biesmans and Wilmsen processes to obtain the desired physical characteristics.

In regard to claim 5, Biesmans teaches the use of a polymeric isocyanate Suprasec DNR – a commercially available product. Absorbance ratio is an inherent feature of the isocyanate product and therefore is not patentable over the prior art which discloses the use of an isocyanate. See MPEP 2111.04-II.

In regard to claim 17, Biesmans teaches increasing the temperature at a rate of 0.6°C/min, within the claimed range of claim 17 [Page 62, Column 2, line 2].

In regard to claim 18, Biesmans teaches pyrolysis in an argon atmosphere [See Page 65, 2nd Paragraph].

In regard to claim 27, Biesmans teaches the process for making such a foam and the resultant foam having the claimed properties [See entire reference, particularly Figure 4, Table 1, Abstract and Introduction].

In regard to claims 28 and 29, carbon aerogels disclosed in the Biesmans reference, because of their high temperature insulation properties, can be used as materials in energy storage devices, for example in intercalation anodes for

rechargeable lithium batteries and in electrodes for double-layer capacitors [See Biesmans, Page 65, Paragraph 1].

Claims 2, 3, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and further in view of Pekala et al. (Third International Symposium on Aerogels (1991)).

The Biesmans and Wilmsen references teach all of the limitations of claim 1 but fail to teach the polymer foam to be urea-formaldehyde resin or a melamine-formaldehyde resin.

Pekala teaches the synthesis of organic aerogels. Starting materials include resorcinol with formaldehyde and melamine with formaldehyde. The reference also teaches any multifunctional monomer can be polymerized to form an aerogel [See Page 7, Summary].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize a formaldehyde polymer foam such as those disclosed in the Pekala reference because the structure and properties of the desired areogel (like that

disclosed in Biesmans and Wilmsen) are dictated by polymerization conditions and formaldehyde resins and their uses have been shown to be known in the art.

Claims 6-8 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and further in view of Falkenstein et al. (US Patent No. 4,066,580).

The Biesmans and Wilmsen references teach all of the limitations of claim 1 but fail to teach the particular method of preparing polymeric isocyanate adducts.

Falkenstein teaches a process for the manufacture of polyisocyanurate foams [See Claims].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize a isocyanate production process like that disclosed in the Falkenstein reference because the structure and properties of the desired areogel (like that disclosed in Biesmans and Wilmsen) are not affected by the production process of the starting material and one skilled in the art would be able to utilize any well known production process.

In regard to claim 30, carbon aerogels disclosed in the Biesmans reference, because of their high temperature insulation properties, can be used as materials in energy storage devices, for example in intercalation anodes for rechargeable lithium batteries and in electrodes for double-layer capacitors [See Biesmans, Page 65, Paragraph 1].

Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and further in view of Wallajapet et al. (US Patent No. 5,948,829) and Heinz et al. (US Patent No. 5,880,168).

In regard to amended claims 9 and 10, the Biesmans, Wilmsen, and Wallajapet references fail to explicitly teach a specific isocyanate adduct.

Heinze et al. is drawn to foam compositions based on isocyanate. The foams are produced by reacting polyisocyanates with compounds having hydrogen atoms which are reactive toward isocyanates [See Abstract]. The most important starting materials here are polyfunctional isocyanates. Chemical structures formed from these polyisocyanates can be polyurethanes, polyureas, polyisocyanates and further isocyanate adducts such as allophanates, biurets, carbodiimides, oxazolidones, polyimides, polyamides, etc [See Column 1, lines 10-25].

One of skill in the art, at the time of Applicant's invention, would have been motivated to use a polymeric isocyanate adduct like those taught in the Heinze reference, because the foams based on isocyanate which are produced by reacting polyisocyanates with polyols have the greatest industrial importance [See Column 1, lines 19-21].

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and further in view of Gregg et al. (US Patent No. 5,840,443).

In regard to claim 11, the Biesmans and Wilmsen references teach all of the limitations of claim 1 but fail to teach a crown ether structure catalyst.

Gregg et al. teaches a high surface area electrode that is a carbon foam [See Claim 9]. The electrode comprises a redox polymer material such as a crown ether [See Claim 1].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to add a crown ether to the carbon nanotube structure of the Biesmans and Wilmsen references because the Gregg reference teaches an electrode cell, a common use of such a carbon foam [See Biesmans, Page 65, Paragraph 1].

Claims 12, 16 and 19-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and further in view of Stankiewicz et al. (WO 98/02382)

In regard to amended claim 16, and claims 19-25, the Biesmans and Wilmsen references teach all of the limitations of claim 1 but fail to teach a two step pyrolysis in the claimed temperature ranges.

Biesmans teaches pyrolysis takes place between 0°C and 900°C. The reference does not disclose heating up to 1200°C or 1500°C but generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). See MPEP 2144.05-II.

In regard to claim 12, Stankiewicz teaches a method for forming a carbon foam. A resin is "cured" in an inert atmosphere such as nitrogen or argon, or in a non-oxidizing atmosphere such as hydrogen. After curing the piece is carbonized to vitreous carbon

in an atmosphere at a suitable temperature between 900°C and 3000°C. Here under atmospheric conditions, carbon dioxide, nitrogen, and water vapor are present [See Page 6]

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize a two-step pyrolyzation process like that taught in Stankiewicz to form the foam disclosed in the Biesmans and Wilmsen references because the heat up rate controls the amount of exothermic heat released into the work piece. The shape of the cells in the foam is modified because the heat from the exothermic reaction softens the structure. The second phase of the two step process – in atmosphere – would allow greater control over the reaction, in this sense.

In regard to claim 26, flow rate of the gas streams is not explicitly disclosed in the prior art teachings but is an example of a result-effective variable and can be scaled up or down depending on the desired foam output.

New claims 31, 34-36, 38, 39, are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and further in view of Pekala et al. (Third International Symposium on Aerogels (1991)).

In regard to claims 31, and 34-36, Biesmans teaches synthesis of carbon aerogels (foam) by pyrolysis of (nitrogen containing) polyisocyanate based aerogels [See Section 2. Experimental Procedure]. The aerogels have a high porosity (shown in Figure 4) and open cell content (see Table 1). While the Biesman reference does not inherently disclose the values of porosity and open cell content, it would be obvious to one of ordinary skill that a carbon foam, prepared via the same process would have the same instantly claimed physical characteristics. The aerogels of the Biesmans reference are 100% by mass of the polyisocyanate polymer (which is inherently has a nitrogen content of more than 6% by mass). In regard to the weight of carbon, the Biesmans reference teaches a "carbon aerogel" and therefore inherently has a carbon content above 70% by weight.

Biesmans fails to teach the incorporation of an inorganic material into the structure.

Wilmsen teaches a process for producing foams. Calcium carbonate is a possible additive in solid or liquid form [See Claim 9].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize an inorganic oxide such as calcium carbonate as taught by Wilmsen in the foam preparation method taught by Biesmans because such an additive is used

for modifying and improving the structural and physical properties of the foam [See Wilmsen, Column 3, lines 46-48].

The Biesmans and Wilmsen references fail to explicitly teach further heat treatment in water vapor and/or carbon dioxide.

Wallajapet et al. teaches a foam and process for preparing a polymeric foam. If the recovered foam structure does not yet exhibit the desired physical properties, it may be necessary to treat the recovered polymeric foam structure with an additional process step. Suitable post treatment conditions include using heat treatment or steam or high humidity treatment [See Column 14, lines 48-62]. One of skill in the art would have been motivated to include a further treatment step to the foam produced by the Biesmans and Wilmsen processes to obtain the desired physical characteristics.

In regard to claim 38, Biesmans teaches increasing the temperature at a rate of 0.6°C/min, within the claimed range of claim 17 [Page 62, Column 2, line 2].

In regard to claim 39, Biesmans teaches pyrolysis in an argon atmosphere [See Page 65, 2nd Paragraph].

The Biesmans, Wilmsen, Wallajapet references fail to teach the polymer foam to be urea-formaldehyde resin or a melamine-formaldehyde resin.

Pekala teaches the synthesis of organic aerogels. Starting materials include resorcinol with formaldehyde and melamine with formaldehyde. The reference also teaches any multifunctional monomer can be polymerized to form an aerogel [See Page 7, Summary].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize a formaldehyde polymer foam such as those disclosed in the Pekala reference because the structure and properties of the desired areogel (like that disclosed in Biesmans and Wilmsen) are dictated by polymerization conditions and formaldehyde resins and their uses have been shown to be known in the art.

Claims 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and Pekala et al. (Third International Symposium on Aerogels (1991)) and further in view of Gregg et al. (US Patent No. 5,840,443).

In regard to claim 32, the references fail to teach a crown ether structure catalyst.

Gregg et al. teaches a high surface area electrode that is a carbon foam [See Claim 9]. The electrode comprises a redox polymer material such as a crown ether [See Claim 1].

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to add a crown ether to the carbon nanotube structure of the Biesmans and Wilmsen references because the Gregg reference teaches an electrode cell, a common use of such a carbon foam [See Biesmans, Page 65, Paragraph 1].

Claims 33 and 40-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Biesmans et al. (Journal of Non-Crystalline Solids 225 (1998) 64-68) in view of Wilmsen (US Patent No. 4,043,950) and Wallajapet et al. (US Patent No. 5,948,829) and Pekala et al. (Third International Symposium on Aerogels (1991)) and further in view of Stankiewicz et al. (WO 98/02382)

In regard to claims 33, 37 and 40-46, the references fail to teach a two step pyrolysis in the claimed temperature ranges.

Biesmans teaches pyrolysis takes place between 0°C and 900°C. The reference does not disclose heating up to 1200°C or 1500°C but generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or

temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). See MPEP 2144.05-II.

In regard to claim 33, Stankiewicz teaches a method for forming a carbon foam. A resin is "cured" in an inert atmosphere such as nitrogen or argon, or in a non-oxidizing atmosphere such as hydrogen. After curing the piece is carbonized to vitreous carbon in an atmosphere at a suitable temperature between 900°C and 3000°C. Here under atmospheric conditions, carbon dioxide, nitrogen, and water vapor are present [See Page 6]

It would have been obvious to one of ordinary skill, at the time of Applicant's invention, to utilize a two-step pyrolyzation process like that taught in Stankiewicz to form the foam disclosed in the Biesmans and Wilmsen references because the heat up rate controls the amount of exothermic heat released into the work piece. The shape of the cells in the foam is modified because the heat from the exothermic reaction softens the structure. The second phase of the two step process – in atmosphere – would allow greater control over the reaction, in this sense.

Response to Arguments

Applicant's arguments filed on 10/24/2008 have been fully considered but they are not persuasive. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection. The amendments to claim 1 have necessitated the new ground. Wallajapet et al. remedies the deficiencies presented by the Applicants.

Applicant argues the various references do not make any mention of carbon aerogels. Biesmans et al. notes "synthesis of pure carbon aerogels is usually carried out by pyrolysis aerogels at high temperatures" [See Page 65, Column 1].

Conclusion

Claims 1-47 are rejected.

No claims are allowed.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER A. SMITH whose telephone number is (571)270-3599. The examiner can normally be reached on Monday - Friday, 8:30am to 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571)272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.A. LORENZO/
Supervisory Patent Examiner, Art Unit 1793

Jennifer A. Smith

Application/Control Number: 10/526,930

Page 19

Art Unit: 1793

January 6, 2008

Art Unit 1793

JS